



Designation: A950/A950M – 11 (Reapproved 2023)

Standard Specification for Fusion-Bonded Epoxy-Coated Structural Steel H-Piles and Sheet Piling¹

This standard is issued under the fixed designation A950/A950M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers structural steel H-piles and sheet piling with protective fusion-bonded epoxy coating applied by the electrostatic spray, flocking, or fluidized bed process.

NOTE 1—The coating applicator is identified throughout this specification as the manufacturer.

1.2 Requirements for coatings are contained in [Annex A1](#).

1.3 This specification is applicable for orders in either inch-pound units (as Specification A950) or SI units (as Specification A950M). The values stated in either inch-pound or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

- [A6/A6M Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling](#)
- [A36/A36M Specification for Carbon Structural Steel](#)
- [A328/A328M Specification for Steel Sheet Piling](#)

¹ This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is under the direct responsibility of Subcommittee A01.02 on Structural Steel for Bridges, Buildings, Rolling Stock and Ships.

Current edition approved May 1, 2023. Published June 2023. Originally approved in 1995. Last previous edition approved in 2015 as A950/A950M – 11 (2015). DOI: 10.1520/A0950_A0950M-11R23.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[A572/A572M Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel](#)

[A588/A588M Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi \[345 MPa\] Minimum Yield Point, with Atmospheric Corrosion Resistance](#)

[A690/A690M Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments](#)

[A857/A857M Specification for Steel Sheet Piling, Cold Formed, Light Gage](#)

[B117 Practice for Operating Salt Spray \(Fog\) Apparatus](#)

[G8 Test Methods for Cathodic Disbonding of Pipeline Coatings](#)

[G12 Test Method for Nondestructive Measurement of Film Thickness of Pipeline Coatings on Steel \(Withdrawn 2013\)](#)³

[G14 Test Method for Impact Resistance of Pipeline Coatings \(Falling Weight Test\)](#)

[G20 Test Method for Chemical Resistance of Pipeline Coatings](#)

2.2 *American Petroleum Institute Specification:*⁴

[API RP 5L7 Recommended Practice for Internal Fusion Bonded Epoxy Coating of Line Pipe](#)

2.3 *National Association of Corrosion Engineers Standard:*⁵

[TM0175 Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Shot or Steel Grit \(Nace No. 2\)](#)

2.4 *Steel Structures Painting Council Standards:*⁶

[SSPC-SP 1 Surface Preparation Specification No. 1: Solvent Cleaning](#)

[SSPC-SP 10 Near-White Blast Cleaning](#)

[SSPC-VIS 1 Visual Standards](#)

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American Petroleum Institute (API), 200 Massachusetts Avenue, NW Suite 1100 Washington, DC 20001-5571, <http://www.api.org>.

⁵ Available from NACE International (NACE), 15835 Park Ten Pl., Houston, TX 77084, <http://www.nace.org>.

⁶ Available from Society for Protective Coatings (SSPC), 800 Trumbull Drive, Pittsburgh, PA 15205, <https://www.sspc.org>.

3. General Requirements for Delivery

3.1 Structural products furnished under this specification shall conform to the requirements of Specification **A6/A6M**, for the specific structural product order, unless a conflict exists in which case this specification shall prevail.

4. Ordering Information

4.1 Information items to be considered, if appropriate, for inclusion in purchase orders are as follows:

- 4.1.1 Specification designation and year of issue for H-pile or sheet piling,
- 4.1.2 Section,
- 4.1.3 Quantity,
- 4.1.4 Length,
- 4.1.5 Portions to be coated (full length or distance from end to remain bare),
- 4.1.6 Requirements for certifications (see **14.1**),
- 4.1.7 Requirements for material samples (see **5.3**),
- 4.1.8 Requirements for patching material sample (see **5.5**),
- 4.1.9 Requirements for visual standard of comparison for surface cleaning (see **6.1**),
- 4.1.10 Requirements for number and frequency of tests (see **9.1**), and
- 4.1.11 Requirements for inspection at the manufacturing plant (see **12.1**).

NOTE 2—An example of an ordering description is as follows: Structural steel sheet piling, Grade 60, Type 1, to ASTM A572 – ; section PZ35, 20 000 ft, 40 ft, 0 in. long in secured lifts, epoxy-coated to ASTM A950 – , including certification for coated sheet piling, sample of coating material, 2 gal of patching material, and surface cleaning comparison with SSPC-VIS 1.

[Structural steel sheet piling, Grade 400, Type 1, to ASTM A572M – ; section PZ35, 6000 m, 12 m long in secured lifts, epoxy-coated to ASTM A950M – , including certification for coated sheet piling, sample of coating material, 8 L of patching material, and surface cleaning comparison with SSPC-VIS 1].

5. Materials

5.1 Steel H-piles to be coated shall meet the requirements of Specifications **A36/A36M**, **A572/A572M**, **A588/A588M**, or **A690/A690M**, whichever is specified in the order. Steel sheet piling to be coated shall meet the requirements of Specifications **A328/A328M**, **A572/A572M**, **A690/A690M**, or **A857/A857M**, whichever is specified in the order.

NOTE 3—Surface conditions such as slivers, gouges, laminations, pits, and sharp edges can cause coating application difficulties and effort should be made to hold these conditions to a minimum.

5.2 The coating material shall meet the requirements listed in **Annex A1** and shall be approved by the purchaser.

5.2.1 A written certification shall be furnished to the purchaser that properly identifies the batch designation of the powder coating used in the order, material, quantity represented, date of manufacture, name and address of manufacturer, and a statement that the supplied powder coating is the same composition as that prequalified to **Annex A1** of this specification. The powder coating shall be used within the manufacturer's written recommended shelf life.

5.3 If specified in the order, a representative 8 oz. [0.2 kg] sample from each batch of the powder coating shall be supplied

to the purchaser. The sample shall be packaged in an airtight container and identified by the batch designation.

5.4 The powder coating shall be maintained in a temperature-controlled environment following the written recommendations of the powder coating manufacturer until ready for use, at which point the powder coating will be given sufficient time to reach approximate plant ambient temperature.

5.5 The patching material shall be as recommended by the powder coating manufacturer and shall be compatible with the coating. If specified in the order, a sample of the patching material shall be supplied to the purchaser.

6. Surface Preparation

6.1 Prior to blast cleaning, the surfaces of steel H-piles and sheet piling to be coated shall be precleaned, as required, in accordance with SSPC-SP 1. Steel surfaces shall be cleaned by abrasive blast cleaning to near-white metal in accordance with SSPC-SP 10. The cleaning media used shall produce an anchor pattern profile of 1.5 mils to 4.0 mils [40 μm to 100 μm]. The visual standard of comparison used to define the final surface condition shall be SSPC-VIS 1 or TM0175. Expended blasting media debris and dust shall be removed from blasted surfaces prior to applying coating.

6.2 Prior to application of the fusion-bonded epoxy coating, raised slivers, scabs, laps, sharp edges, or seams shall be removed using abrasive grinders. No individual area of grinding shall exceed 36 in.² [230 cm²]. Total area of grinding shall not exceed 1 % of total surface area.

6.3 Slivers raised during the cleaning or coating application process shall be treated as permissible coating damage and repaired in accordance with Section **11**.

6.4 It shall be permissible for a chemical wash and/or conversion of the steel H-piles or sheet piling surface to be used. This pretreatment shall be applied after abrasive blast cleaning and before coating, in accordance with the written application instructions specified by the pretreatment manufacturer.

7. Application of Coating

7.1 The powder coating shall be applied to the cleaned and pretreated (if applicable) surface as soon as possible and before visible oxidation of the surface occurs, as discernible to a person with normal or corrected vision. In no case shall application of the coating be delayed more than 3 h after cleaning.

7.2 To achieve the required coating thickness (see **8.1**), the steel shall be preheated prior to applying the powder coating in accordance with the manufacturer's written recommendations. The heat source shall not leave a residue or contaminant on the steel surfaces. If oxidation occurs, the steel shall be cooled to ambient temperature and recleaned before applying the powder coating.

7.3 The powder coating shall be applied and cured in accordance with the powder coating manufacturer's written recommendations.

7.4 Areas of steel sections not requiring coating to allow welding or for other purposes shall be specified by the purchaser and shall be blocked-out during the coating application.

8. Requirements for Coated H-Piles and Sheet Piling

8.1 Thickness of Coating:

8.1.1 The minimum thickness of coating after curing on flat surfaces of H-piles and sheet piling shall be 12 mils [300 μm]. The minimum thickness of coating after curing on edges and corners of sections, as measured on flat surfaces $\frac{1}{2}$ in. [13 mm] from these edges and corners of sections, shall be a minimum of 7 mils [175 μm]. It shall be permissible for the coating thickness to be reduced on the ball and socket of sheet piling.

8.1.2 Measurements shall be made in accordance with Test Method **G12** following the instructions for calibration and use recommended by the thickness gauge manufacturer. Gauges shall be of the pull-off or fixed probe type, except that “pencil-type” pull-off gauges, which require the operator to observe the readings at the instant the magnet is pulled from the surface, shall not be used.

8.1.3 Thickness measurements on test sheet piling sections shall be taken on flat surfaces and corners of each side and edge at 2 ft [0.6 m] intervals along piling sections. Thickness measurements on test H-piles shall be taken alternately on the edges of flanges, outside and inside of flat surfaces of flanges, intersection of flanges and web, and on each side of the web at 2 ft intervals along H-pile sections.

NOTE 4—Powder coating overspray at interlock segments of sheet piling is inherent to the coating process and should be considered to be acceptable. A heavier coating thickness in these areas may result in the inability to join pieces.

8.2 Continuity of Coating:

8.2.1 Damaged or deficiently coated areas, as discernible to a person with normal or corrected vision, shall be patched in accordance with the patching manufacturer’s written recommendations.

8.2.2 The applied coating after curing shall not have more than an average of two holidays (pinholes not discernible to a person with normal or corrected vision) per square foot [21 holidays per square metre] of the coated section, as determined by dividing the total number of holidays for the individual section checked by its total outside surface area.

8.2.3 Holiday checks to determine acceptability shall be made only at the manufacturer’s plant with a 67.5-V direct current, 80 000- Ω wet sponge holiday detector.

8.2.4 Holiday checks on test sheet piling sections shall be made on flat surfaces and corners of each side and edge at 2 ft [0.6 m] intervals along piling sections. Holiday checks on test H-piles shall be taken alternately on the edges of flanges, outside and inside of flat surfaces of flanges, intersection of flanges and web, and on each side of the web at 2 ft intervals along pile sections.

8.3 Flexibility of the Coating:

8.3.1 Flexibility of the coating shall be checked by bending coated test panels. Test panels shall be of the same thickness as the respective sheet piling sections or H-pile flange and shall be

coated along with these sections using the same application equipment and procedures.

NOTE 5—Bend tests to determine coating flexibility acceptance are intended to be performed at the manufacturer’s plant.

8.3.1.1 Test panels shall be bent around a mandrel to a minimum of 1.5° total deflection (after rebound) at ambient temperature in accordance with 5.3.3.1 of API RP 5L7. The radius of the mandrel shall be calculated using the following equation:

$$R = 37.7t$$

where:

R = mandrel radius, and
 t = panel thickness including coating.

When no mandrel of the calculated size is available, it shall be permissible that a smaller radius mandrel be substituted.

8.3.2 No cracking or disbonding of the coating on the outside radius of the test panels shall be discernible to a person with normal or corrected vision. Except as specified in Section **10**, cracking or disbonding of the coating shall be cause for rejection of the coated H-piles or sheet piling represented by the bend test panels.

8.3.3 Fracture or failure of the steel in the bend test shall not be considered a failure of the coating. Another test panel from the same production lot shall be substituted for repeat testing.

8.4 All requirements for coated H-piles and sheet piling shall be met at the manufacturer’s plant prior to shipment.

9. Number of Tests

9.1 Unless a higher number or higher frequency, or both, is specified in the order, one test for coating thickness, continuity, and flexibility shall be made once every 4 h.

10. Retests

10.1 If any test specimen for coating thickness, continuity, or flexibility fails to meet the specified requirements, two further coated specimens from the same lot shall be subjected to the test or tests in which the original sample failed. If both additional coated test specimens pass the retest, the lot from which they were taken shall be deemed to meet the requirements of this specification. If either of them fails, the lot shall be deemed not to comply with this specification.

10.2 If the lot does not comply with this specification, the lot immediately preceding and immediately following the non-compliant lot shall have two test pilings selected from them which shall be subjected to the test or tests in which the original pilings failed. If all test pilings pass the retests, the lots shall be deemed in compliance with this specification.

10.3 In the case of a second non-compliant lot, the untested lot immediately next to it, which may be preceding or following, shall be subjected to a retest. This procedure shall be repeated until a compliant lot is tested.

NOTE 6—In the use of the retest provision of this specification, a lot is defined as the H-piles or sheet piling that are not represented by the sample that has been tested. A certain number of H-piles or sheet piling have been coated since the last acceptance test was performed and accepted. The H-piles or sheet piling that have been coated since that last test should be divided into four equal time period groups according to